

## REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of October 7, 2011 is respectfully requested.

By this Amendment, claims 1, 2, 11 and 12 have been amended. Thus, claims 1-30 are currently pending in the application. No new matter has been added by these amendments.

On page 2 of the Office Action, the Examiner rejected claims 2, 23, 26 and 30 under 35 U.S.C. § 112, second paragraph as being indefinite. In particular, the Examiner indicated that the meaning of the phrase “steady concentration profile” is unclear, and provided several possible meanings of the phrase “steady concentration profile.” In this regard, Applicant notes that the “steady concentration profile” means that the concentration of the desired decomposition products at a given point over a given period of time remains relatively constant (*i.e.*, the last of the possible meanings identified by the Examiner). Applicant further notes that this meaning is at least implicitly supported by paragraph [0012] of the original specification. Accordingly, as the meaning of the phrase “steady concentration profile” is believed to be clear in light of the specification, it is respectfully submitted that the Examiner’s § 112 rejection is not applicable to claims 2, 23, 26 and 30.

On pages 3-8 of the Office Action, the Examiner rejected claims 1, 2, 9-13, 15, 23, 26, 29 and 30 under 35 U.S.C. § 102(b) as being anticipated by Potter et al. (US 4,014,786). On pages 8-9 of the Office Action, the Examiner rejected claims 2, 26 and 30 under 35 U.S.C. § 102(b) as being anticipated by Allen et al. (US 4,589,927). Further, on pages 10-15 of the Office Action, the Examiner rejected claims 14 and 16-23 under 35 U.S.C. § 103(a) as being unpatentable over Potter or Allen, and in view of the additionally cited prior art. For the reasons discussed below, it is respectfully submitted that these claims, including independent claims 1, 2, 11 and 12, are clearly patentable over the applied prior art.

Amended independent claim 1 recites a method of producing sub-critical water decomposition products. The method of claim 1 includes continuously supplying material to be processed into a vertical reactor *through an inlet provided at the bottom of the reactor*, whose interior is kept at a sub-critical condition for water. The method of claim 1 also includes *continuously taking out a liquid containing a decomposition product through any selected one of a plurality of outlets provided in a wall of the reactor* at respective positions which are higher than a position where the inlet of the reactor is provided, *wherein selection of one of the outlets*

*adjusts a distance along which the liquid containing the decomposition product flows through the reactor so as to adjust residence time of the liquid containing the decomposition product in the reactor.*

Potter discloses an apparatus for carbon separation in which a mixture of particulate carbon, water and liquid organic extractant is separated into a stream of particulate carbon-liquid organic extractant and a stream of clarified water. However, it is noted that Potter does not disclose a method of producing sub-critical water decomposition products, which includes continuously taking out a liquid containing a decomposition product through any selected one of a plurality of outlets, as required by claim 1.

Rather, Potter discloses a method of separating a mixture of particulate carbon, water and liquid organic extractant into a stream of particulate carbon-liquid organic extractant and a stream of clarified water by gravity within a decanter, but does not even remotely disclose that a decomposition reaction takes place within the decanter. Thus, the method of separating liquids disclosed in Potter is fundamentally different from the method of producing sub-critical water decomposition products of claim 1.

In this regard, it is noted that on page 3 of the Office Action, the Examiner indicates that the conditions within the decanter of Potter are such that the decanter “is capable of allowing reactions to occur in the feed.” Regardless of whether the Examiner’s assertion is correct that the decanter of Potter is “capable” of allowing reactions to occur in the feed, it does not change the fact that Potter simply does not disclose a method of producing sub-critical water decomposition products, which includes continuously taking out a liquid containing a decomposition product through any selected one of a plurality of outlets, as required by claim 1, and therefore by definition, Potter does not anticipate claim 1.

Further, it is noted that Potter does not disclose a method which includes continuously supplying material to be processed into a vertical reactor *through an inlet provided at the bottom of the reactor*, as required by claim 1. Rather, Potter discloses that the liquid mixture is supplied into the decanter through nozzles 45 and 52 which are arranged at  $\frac{1}{4}$  to  $\frac{3}{4}$  of the vessel height along the vertical axis of the decanter, as shown in Fig. 1 (and as discussed in the abstract and column 8, lines 27-28), and therefore Potter does not disclose supplying material to be processed into a vertical reactor through an inlet provided at the bottom of the reactor, as required by claim 1.

Therefore, as Potter does not disclose a method of producing sub-critical water decomposition products, which includes continuously supplying material to be processed into a vertical reactor through an inlet provided at the bottom of the reactor, and continuously taking out a liquid containing a decomposition product through any selected one of a plurality of outlets, as required by claim 1, it is respectfully submitted that Potter does not anticipate claim 1. Allen discloses a process in which a liquid fluidization medium is introduced into a reactor 1 through a conduit 7, as shown in Fig. 1. Further, Allen discloses that a fine particle component is removed from the reactor 1 and is sent to a separator 9 and an external reactor 10 before being reintroduced into the reactor 1.

Amended independent claim 2 recites a method of producing sub-critical water decomposition products. The method of claim 2 includes continuously supplying material to be processed into a vertical reactor *through an inlet provided at a bottom of the reactor*, and *continuously taking out a liquid containing desired decomposition products* through any one of a plurality of outlets provided at respective positions which are higher than a position where the inlet of the reactor is provided, *to form desired steady concentration profiles of the desired decomposition products in the reactor*, with the plurality of outlets being provided directly in a sidewall of the reactor.

As is discussed above, Potter does not disclose a method of producing sub-critical water decomposition products, which includes continuously taking out a liquid containing desired decomposition products through any selected one of a plurality of outlets, as required by claim 2.

Rather, Potter discloses a method of separating a mixture of particulate carbon, water and liquid organic extractant into a stream of particulate carbon-liquid organic extractant and a stream of clarified water by gravity within a decanter, but does not even remotely disclose that a decomposition reaction takes place within the decanter. Thus, the method of separating liquids disclosed in Potter is fundamentally different from the method of producing sub-critical water decomposition products of claim 2.

As is also discussed above, regardless of whether the Examiner's assertion is correct that the decanter of Potter is "capable" of allowing reactions to occur in the feed, it does not change the fact that Potter simply does not disclose a method of producing sub-critical water decomposition products, which includes continuously taking out a liquid containing desired

decomposition products through any selected one of a plurality of outlets, as required by claim 2, and therefore by definition, Potter does not anticipate claim 2.

Additionally, as also discussed above, it is noted that Potter does not disclose a method which includes continuously supplying material to be processed into a vertical reactor *through an inlet provided at the bottom of the reactor*, as required by claim 2. Rather, Potter discloses that the liquid mixture is supplied into the decanter through nozzles 45 and 52 which are arranged at  $\frac{1}{4}$  to  $\frac{3}{4}$  of the vessel height along the vertical axis of the decanter, as shown in Fig. 1 (and as discussed in the abstract and column 8, lines 27-28), and therefore Potter does not disclose supplying material to be processed into a vertical reactor through an inlet provided at the bottom of the reactor, as required by claim 2.

Further, in addition to the fact that Potter does not disclose continuously taking out a liquid containing desired decomposition products through any selected one of a plurality of outlets, it is also noted that Potter does not disclose continuously taking out a liquid containing desired decomposition products through any one of a plurality of outlets to *form desired steady concentration profiles of the desired decomposition products in the reactor*, with the plurality of outlets being provided directly in a sidewall of the reactor, as required by claim 2.

In this regard, it is noted that on page 4 of the Office Action, the Examiner notes that Potter discloses trycocks 20 in the sidewall of the reactor through which liquid samples may be taken, and that such sampling “provides information about the concentration of decomposition products at a given height,” and that “the profile is kept steady in that organics fraction exit the top while water fraction exits the bottom.”

However, it is first noted that even if the Examiner’s assertion is correct that sampling the liquid by opening one of the trycocks 20 “provides information about the concentration,” Potter does not even remotely disclose that such sampling of the liquid forms desired steady concentration profiles of desired decomposition products in the reactor. Further, with regard to the Examiner’s indication that “the profile is kept steady in that organics fraction exit the top while water fraction exits the bottom,” it is noted that the exit ports 30 and 35 for the separated liquids are provided on the top and bottom surfaces of the decanter of Potter, and thus are not outlets provided directly in the sidewall of the reactor, as required by claim 2. Thus, even if steady concentration profiles are formed by removing the separated liquids through the exit ports 30 and 35, such a disclosure does not constitute continuously taking out a liquid containing

desired decomposition products through any selected one of a plurality of outlets provided directly in a sidewall of the reactor to form desired steady concentration profiles of the desired decomposition products in the reactor, as required by claim 2.

Therefore, as Potter does not disclose a method of producing sub-critical water decomposition products, which includes (1) continuously supplying material to be processed into a vertical reactor through an inlet provided at the bottom of the reactor, and (2) continuously taking out a liquid containing a decomposition product through any selected one of a plurality of outlets provided directly in a sidewall of the reactor to form desired steady concentration profiles of the desired decomposition products in the reactor, as required by claim 2, it is respectfully submitted that Potter does not anticipate claim 2.

Amended independent claim 11 recites an apparatus for sub-critical water decomposition treatment, comprising a reactor configured to decompose material to be processed using sub-critical water, heating means for heating a mixture composed of water and the to be processed material, compressing means for compressing the mixture and introducing means for introducing the material to be processed into the reactor. Further, the apparatus of claim 11 *includes an inlet through which the material to be processed is to be introduced into the reactor, the inlet being provided at a bottom of the reactor*, and a plurality of outlets provided in a wall of the reactor for letting out a mixture of a decomposition product and water from the reactor. In addition, claim 11 recites that the reactor is a vertical reactor in which liquid flows in only one vertical direction.

As is discussed above, Potter does not disclose a reactor which includes *an inlet through which the material to be processed is to be introduced into the reactor, with the inlet being provided at a bottom of the reactor*, as required by claim 11. Rather, Potter discloses that the liquid mixture is supplied into the decanter through nozzles 45 and 52 which are arranged at  $\frac{1}{4}$  to  $\frac{3}{4}$  of the vessel height along the vertical axis of the decanter, as shown in Fig. 1 (and as discussed in the abstract and column 8, lines 27-28), and therefore Potter does not disclose a reactor which includes an inlet through which the material to be processed is to be introduced into the reactor, with the inlet being provided at a bottom of the reactor, as required by claim 11.

Accordingly, as Potter does not disclose a reactor which includes an inlet through which the material to be processed is to be introduced into the reactor, with the inlet being provided at a bottom of the reactor, as required by claim 11, it is respectfully submitted that Potter does not

anticipate claim 11.

Amended independent claim 12 recites an apparatus for sub-critical water decomposition treatment, comprising a vertical reactor configured to decompose material to be processed with sub-critical water, heating means for heating a mixture of water and the material to be processed and compressing means for compressing the mixture, and introducing means for introducing the material to be processed into the reactor. Further, the apparatus of claim 12 includes *an inlet through which the material to be processed is to be introduced into the reactor, with the inlet being provided at a bottom of the reactor*, and an outlet for letting out a mixture of water and a decomposition product from the reactor at a position higher than a position at which the inlet is provided.

As discussed above, Potter does not disclose a reactor which includes *an inlet through which the material to be processed is to be introduced into the reactor, with the inlet being provided at a bottom of the reactor*, as required by claim 12. Rather, Potter discloses that the liquid mixture is supplied into the decanter through nozzles 45 and 52 which are arranged at  $\frac{1}{4}$  to  $\frac{3}{4}$  of the vessel height along the vertical axis of the decanter, as shown in Fig. 1 (and as discussed in the abstract and column 8, lines 27-28), and therefore Potter does not disclose a reactor which includes an inlet through which the material to be processed is to be introduced into the reactor, with the inlet being provided at a bottom of the reactor, as required by claim 12.

Accordingly, as Potter does not disclose a reactor which includes an inlet through which the material to be processed is to be introduced into the reactor, with the inlet being provided at a bottom of the reactor, as required by claim 12, it is respectfully submitted that Potter does not anticipate claim 12.

With regard to the rejection of independent claim 2 based on Allen, it is noted that, as mentioned above, independent claim 2 recites a method of producing sub-critical water decomposition products. The method of claim 2 includes continuously supplying material to be processed into a vertical reactor through an inlet provided at a bottom of the reactor, and *continuously taking out a liquid containing desired decomposition products* through any one of a plurality of outlets provided at respective positions which are higher than a position where the inlet of the reactor is provided, to form desired steady concentration profiles of the desired

decomposition products in the reactor, *with the plurality of outlets being provided directly in a sidewall of the reactor.*

In addition, the method of claim 2 includes taking out the desired decomposition products through at least one of the outlets, the at least one of the outlets being provided at a position where the concentration of the desired decomposition products is high, *wherein the desired decomposition products taken out of the reactor are not re-supplied into the reactor.* In this regard, it is noted that the limitation of claim 2 which recites that the desired decomposition products taken out of the reactor “are not re-supplied into the reactor” is supported at least by paragraph [0047] of the original specification, which indicates that all of the outlets of the reactor are connected to “reaction-completed-product recovery tank 6,” and by the drawings, which do not disclose any connections from the reaction-completed-product recovery tank 6 back to the reactor (or to any other element of the illustrated device).

Allen discloses a process in which a liquid fluidization medium is introduced into a reactor 1 through a conduit 7, as shown in Fig. 1. Further, Allen discloses that a fine particle component is removed from the reactor 1 and is sent to a separator 9 and an external reactor 10 before being reintroduced into the reactor 1.

However, Allen does not disclose *continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided directly in a sidewall of the reactor*, as required by independent claim 2. In this regard, it is noted that on page 9 of the Office Action, the Examiner indicates that reference numbers 19, 11, 16 and 20 of Allen all correspond to the “plurality of outlets” of claim 2. However, reference numbers 19, 11, 16 and 20 of Allen are not outlets provided directly in a sidewall of the reactor, as required by claim 2.

In particular, it is noted that reference number 19 of Allen is an exhaust stack for waste gas on the top of the reactor, and is not an outlet directly in the sidewall of the reactor through which a liquid containing a decomposition product is continuously taken out, as required by claim 2.

Further, Allen only discloses a single outlet at the upper portion of a side surface of the reactor 1 through which a liquid is taken out. In this regard, it is noted that the reference numbers 11, 16 and 20 are all downstream branches of the conduit which is connected to the single outlet of the reactor 1, and are located entirely outside of the reactor 1, and thus conduits 11, 16 and 20 are not outlets provided directly in the sidewall of the reactor, as required by claim

2.

Therefore, as Allen only discloses a single outlet at the upper portion of the reactor 1 through which a liquid is taken out, Allen does not disclose continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided directly in a sidewall of the reactor, as required by claim 2.

Additionally, Allen does not disclose a method which includes taking out the desired decomposition products through at least one of the outlets (provided directly in the sidewall of the reactor), *wherein the desired decomposition products taken out of the reactor are not re-supplied into the reactor*, as required by claim 2. Rather, Allen specifically discloses that the particle component taken out from the reactor is recirculated through the separator 9, the external reactor 10, and through conduits 7 and 8 back into the reactor (column 2, lines 35-40), and therefore Allen does not disclose a method which includes taking out the desired decomposition products through at least one of the outlets (provided directly in the sidewall of the reactor), wherein the desired decomposition products taken out of the reactor are not re-supplied into the reactor, as required by claim 2.

Accordingly, as Allen does not disclose a method which includes (1) continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided directly in a sidewall of the reactor, and (2) taking out the desired decomposition products through at least one of the outlets, wherein the desired decomposition products taken out of the reactor are not re-supplied into the reactor, as required by claim 2, it is respectfully submitted that Allen does not anticipate claim 2.

In addition, it is respectfully submitted that the additional prior art references applied by the Examiner do not cure the defects of the Potter and Allen references as discussed above.

Further, on page 15 of the Office Action, the Examiner indicates that claims 3-8, 24, 25, 27 and 28 are allowed. As no amendments have been made to claims 3-8, 24, 25, 27 and 28, it is respectfully submitted that these claims remain allowed at least for the reasons indicated by the Examiner.

Therefore, it is respectfully submitted that independent claims 1-4, 11 and 12, as well as claims 5-10 and 13-30 which depend therefrom, are clearly allowable over the prior art of record.

In view of the foregoing amendments and remarks, it is respectfully submitted that the



present application is clearly in condition for allowance. An early notice to that effect is respectfully solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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March 21, 2012